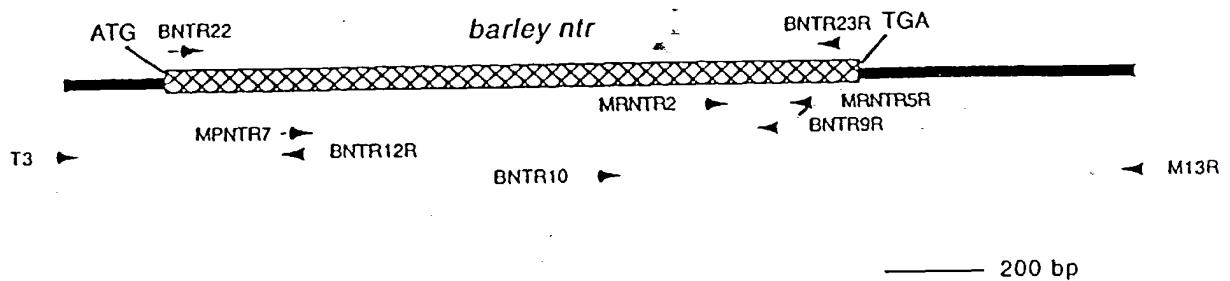


FIGURE 1

## FIGURE 2

## FIGURE 3



# FIGURE 4

A

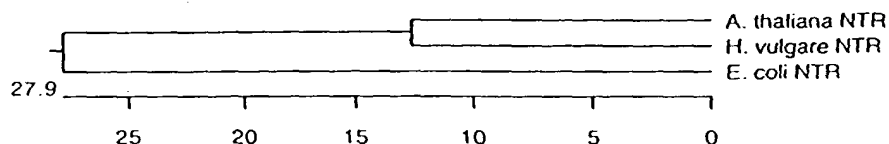
1	MECSAAAPLRTRVCHIGSGPAAHTAATYAARAELKPVLFEGWMANDIAACGQLTVMVE	H. vulgare NTR
1	MNGLETH--NTRICIVGSGPAAHTAATYAARAELKPVLFEGWMANDIAACGQLNOPPER-E	A. thaliana NTR
1	MGTTK---HSKILILIGSGPAGYTAAYAAARANICPVLTIC-----MEKCGQLTVMVE	E. coli NTR
61	NFPGFFTGIMCIDLMONCAOSVRECHNLSLSETVIEVDFSAEPFRVTSDSSTVLACTVW	H. vulgare NTR
58	NFPGFTECHICVELIDKFKOSEREGTTFETETVTKVDFSSKPKIFTDSKAILADAVIL	A. thaliana NTR
52	NWPCDENDLTGPLLVERMHEHATKFEFEHIFDHINKVQLQNRPPRINGNGEYTDALII	E. coli NTR
121	ATGAVARRLIHSGSDT---YNNRGISACAVCDGAAPIFRNKEIAVICGGDSAMEEGNFI	H. vulgare NTR
118	ATGAVARKWISFVSGSEVLCGLNRRGISACAVCDGAAPIFRNKEIAVICGGDSAMEEGNFI	A. thaliana NTR
112	ATGASARYILGLPSEEA---FKGRGVSACTGCGF--FYRNQKVAVICGGENTAVEEALYL	E. coli NTR
177	TKYGSQVYIHRRENTFRASKIMCARALSNPKI-QVVMISEVVEAYGACGGHLAGVKVN	H. vulgare NTR
178	TKYGSQVYIHRRENTFRASKIMCARALSNPKI-LVVMNSVVEAYGACGERDVLGGLKVN	A. thaliana NTR
166	SNIASQVYIHRRENTFRASKIMCARALSNPKI-LVVMNSVVEAYGACGERDVLGGLKVN	E. coli NTR
236	LVTGE-VSDLCVSGLFFAIGHPEATKFLNCOLEIHAQGVVAATKPC-----STHTSVEGVFA	H. vulgare NTR
237	VVTGE-VSDLCVSGLFFAIGHPEATKFLNCGVELDSQGVVATKPC-----TTOTSVEGVFA	A. thaliana NTR
226	TQNSNTIESILVAGLEVAIGHSPNTAIFCOLEIE-NGYIKVQSCIHGNA-TOTSIRGVFA	E. coli NTR
291	AGDVODKKYRQAITAAGSCGMAALDAEHVLOEVGAQVGKSDZ	H. vulgare NTR
292	AGDVODKKYRQAITAAGTCGMAALDAEHVLOEIGSCQGRSD	A. thaliana NTR
285	AGDVMDHYRQAITASATCGMAALDAERVLIDGLADAK	E. coli NTR

Decoration 'Decoration #1': Shade (with solid black) residues that match the Consensus exactly.

B

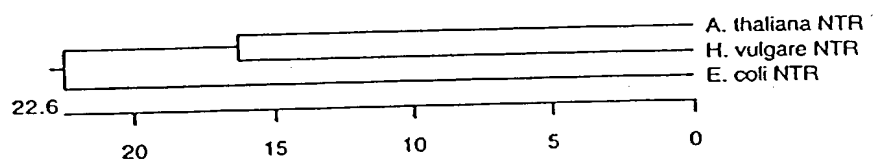
		Percent Similarity				
Percent Divergence		1	2	3		
	1	71.4	39.3	1	H. vulgare NTR	
	2	25.4	37.4	2	A. thaliana NTR	
	3	55.6	56.1	3	E. coli NTR	
		1	2	3		

C



**FIGURE 5****C**

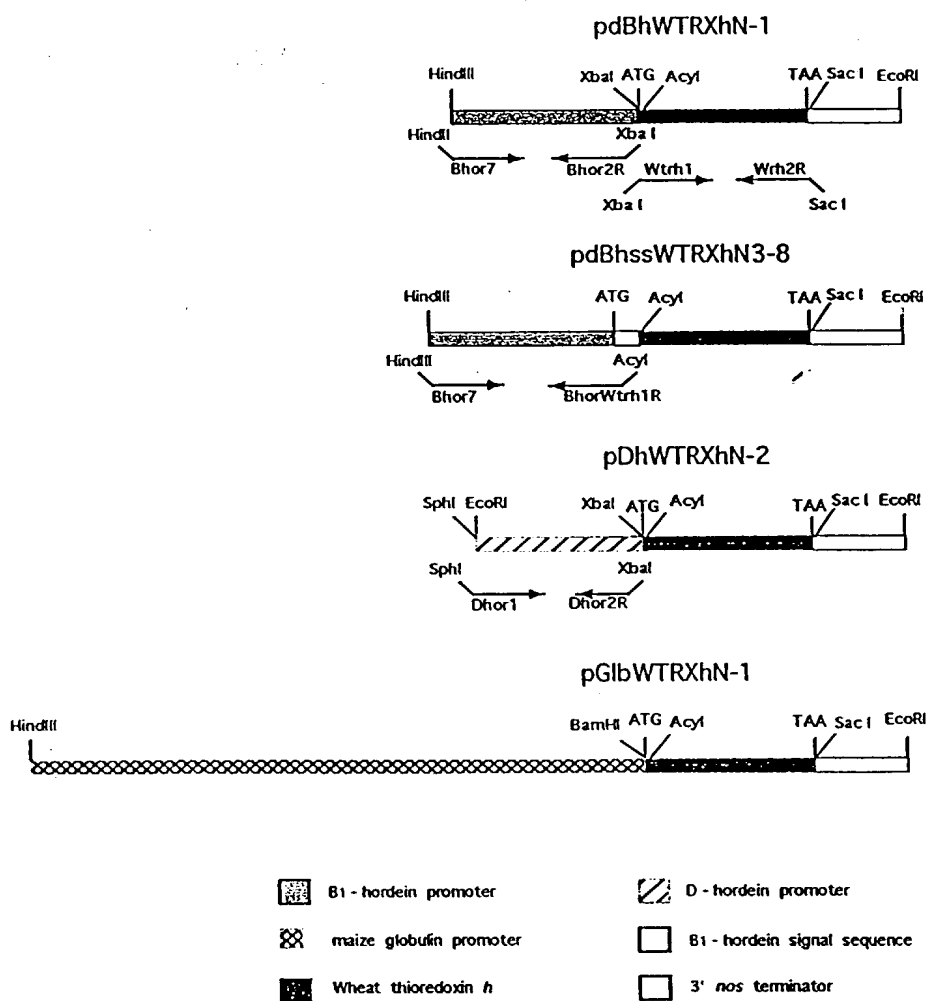
Percent Divergence	Percent Similarity					
	1	2	3			
	1		58.2	40.5	1	H. vulgare NTR
	2	32.7		34.9	2	A. thaliana NTR
	3	45.3	45.0		3	E. coli NTR
		1	2	3		

**D**

Decoration 'Decoration #1': Shade (with solid black) residues that match the Consensus exactly.

Decoration 'Decoration #1': Shade (with solid black) residues that match the consensus named 'Consensus #1' exactly.

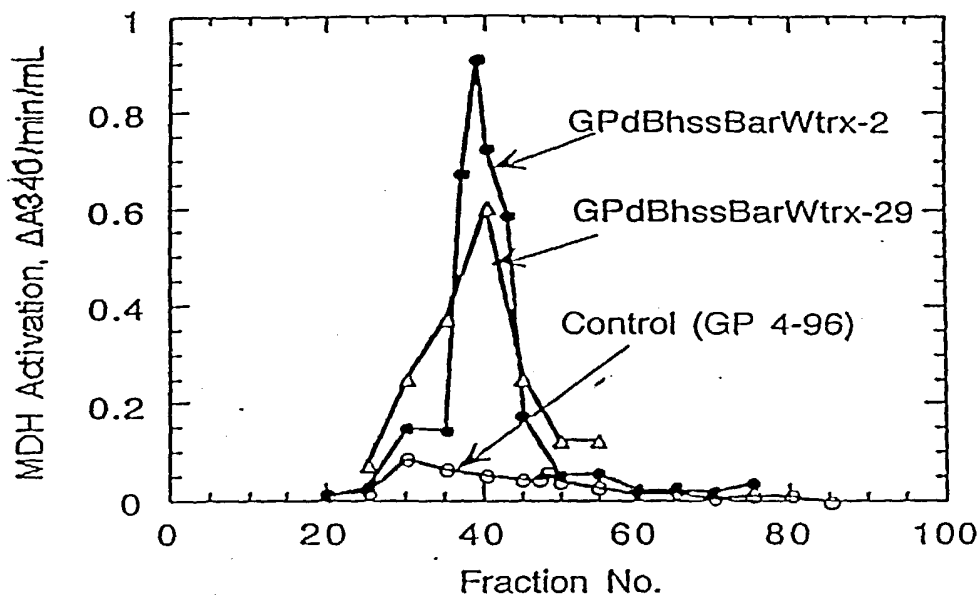
## THIOREDOXIN *h* CONSTRUCTS FOR TRANSFORMATION



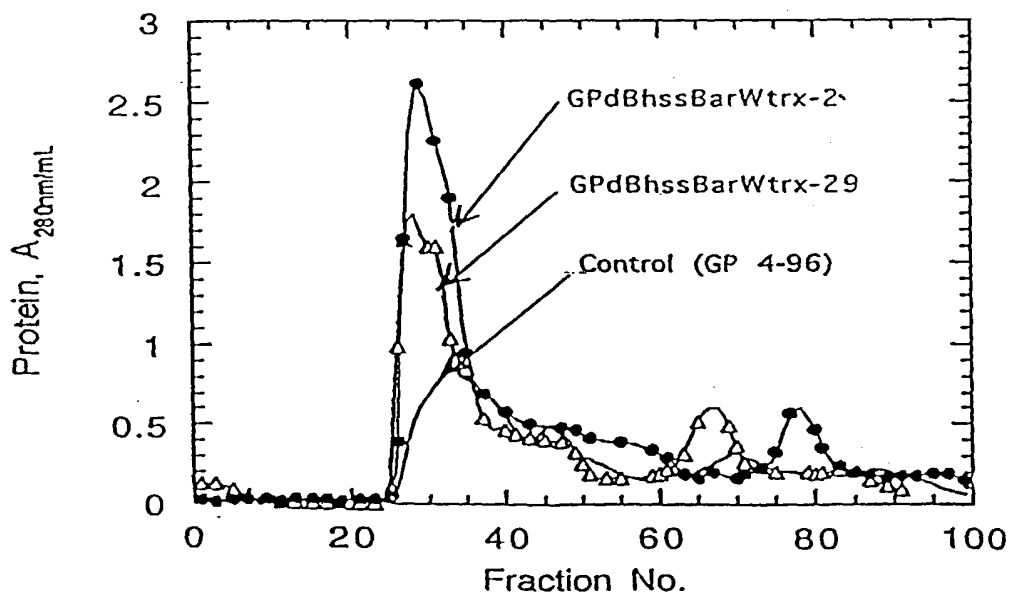
**FIGURE 6**



### Sephadex G-50 Activity Profile of Thioredoxin from Barley Grains (+MDH)



### Sephadex G-50 Elution Profile of Proteins from Three Barley Grains



**FIGURE 7**

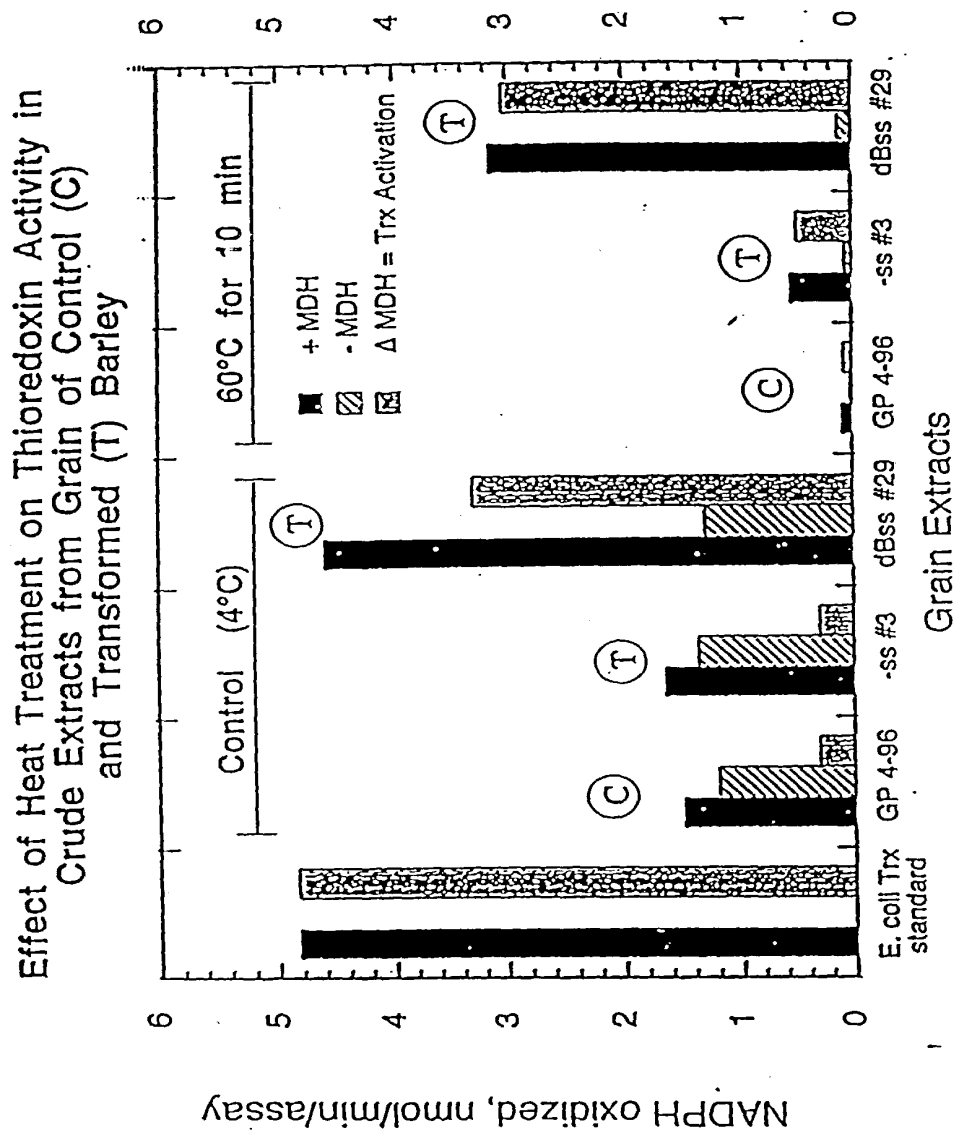
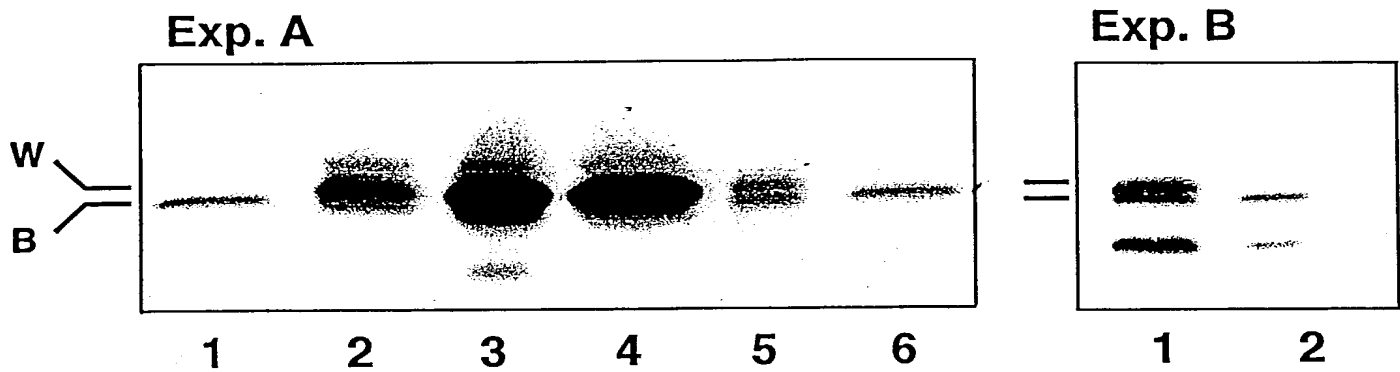


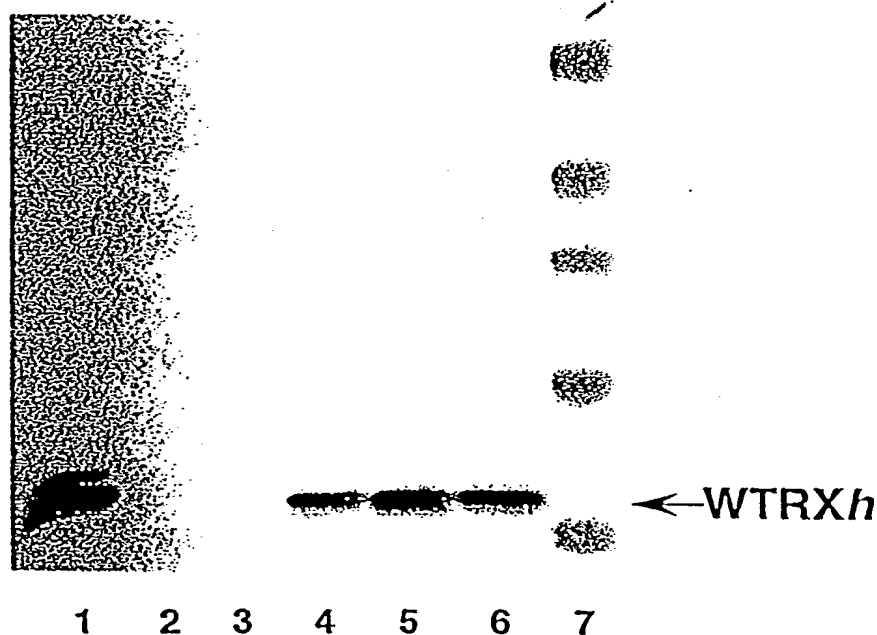
FIGURE 8



**FIGURE 9**

## Western Blot Analysis of Barley Grain Transformed with Wheat Thioredoxin

SDS-PAGE: cv. Golden Promise



1. Wheat germ thioredoxin
2. Control (GP 4-96), nontransformed
3. Control, null segregant (GPdBssBarWtrx-29-11-10)
4. Transformed, heterozygous line (GPdBssBarWtrx-29)
5. Transformed, homozygous line 1 (GPdBssBarWtrx-29-3)
6. Transformed, homozygous line 2 (GPdBssBarWtrx-29-3-2)
7. Prestained standards

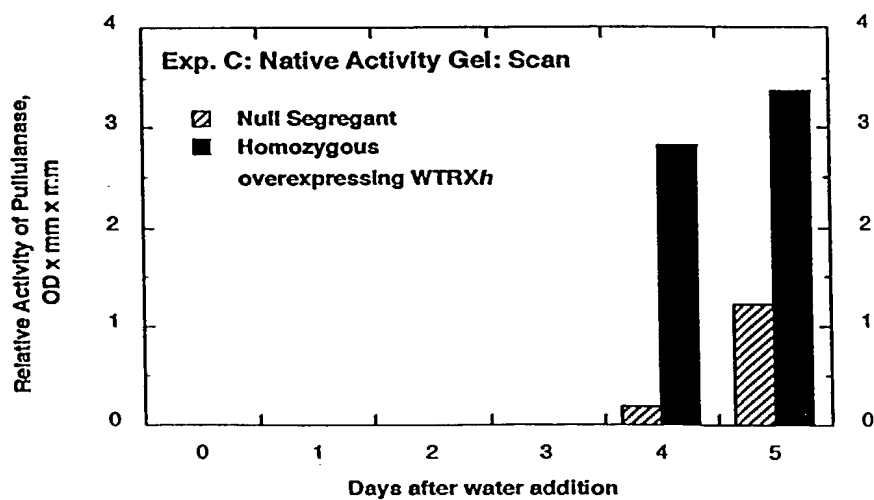
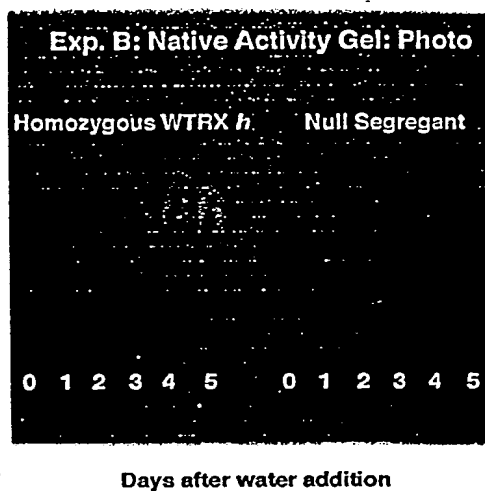
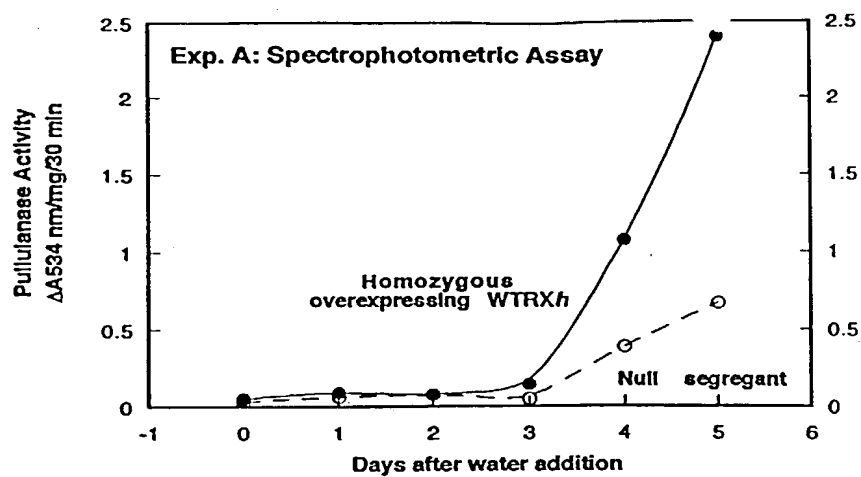
**FIGURE 10**

AAGCTTTAACAACCCACACATTGATTGCAACTTAGTCCTACACAAGTTTTCCATT  
CTTGTTTCAGGCTAACAACCTATACAAGGTTCCTAAAATCATGCAAAAGTGATGC  
TAGGTTGATAATGTGTGACATGTAAAGTGAATAAGGTGAGTCATGCATACCAAA  
CCTCGGGATTTCTATACTTTGTGTATGATCATATGCACA'ACTAAAGGCAACTTT  
GATTATCAATTGAAAAGTACCGCTTGTAGCTTGTGCAACCTAACACAATGTCCA  
AAAATCCATTTGCAAAAGCATCCAAACACAATTGTTAAAGCTGTTCAAACAAC  
AAAGAAGAGATGAAGCCTGGCTACTATAAATAGGCAGGTAGTATAGAGATCTA  
CACAAGCACAAGCATCAAAACCAAGAAACACTAGTTAACACCAATCCACTATGA  
AGACCTTCCTCATCTTTGCACTCCTCGCCATTGCGGCAACAAGTACGATTGCA

## FIGURE 11

CTTCGAGTGCCCGCCGATTTGCCAGCAATGGCTAACAGACACATATTCTGCC  
AAAACCCCGAACAATAATCACTTCTCGTAGATGAAGAGAACAGACCAAGAT  
ACAAACGTCCACGCTTCAGCAAACAGTACCCCGAAGTACTAGGATTAAGCCGAT  
TACGCGGCTTTAGCAGACCGTCCAAAAAACTGTTTTGCAAAGCTCCAATTCC  
TCCTTGCTTATCCAATTTCTTTTGTGTTGGCAAACCTGCACTTGTCCAACCGATT  
TTGTTCTTCCCGTGTTTCTTCTTAGGCTAACTAACACAGCCGTGCACATAGCC  
ATGGTCCGGAATCTTCACCTCGTCCCTATAAAAGCCCAGCCAATCTCCACAAT  
CTCATCATCACCGAGAACACCGAGAACCAAAAAGTACTAGAGATCAATTCATTG  
ACAGTCCACCGAGATGGCTAAGCGGCTGGTCCCTCTTTGTGGCGGTAATCGTC  
GCCCTCGTGGCTCTCACCACCGCT

## FIGURE 12



**FIGURE 13**

### Abundance of $\alpha$ -amylases

### Total Amylase Activity

**0      1      2      3      4      5      6      7**

A

## Null Segregant

B

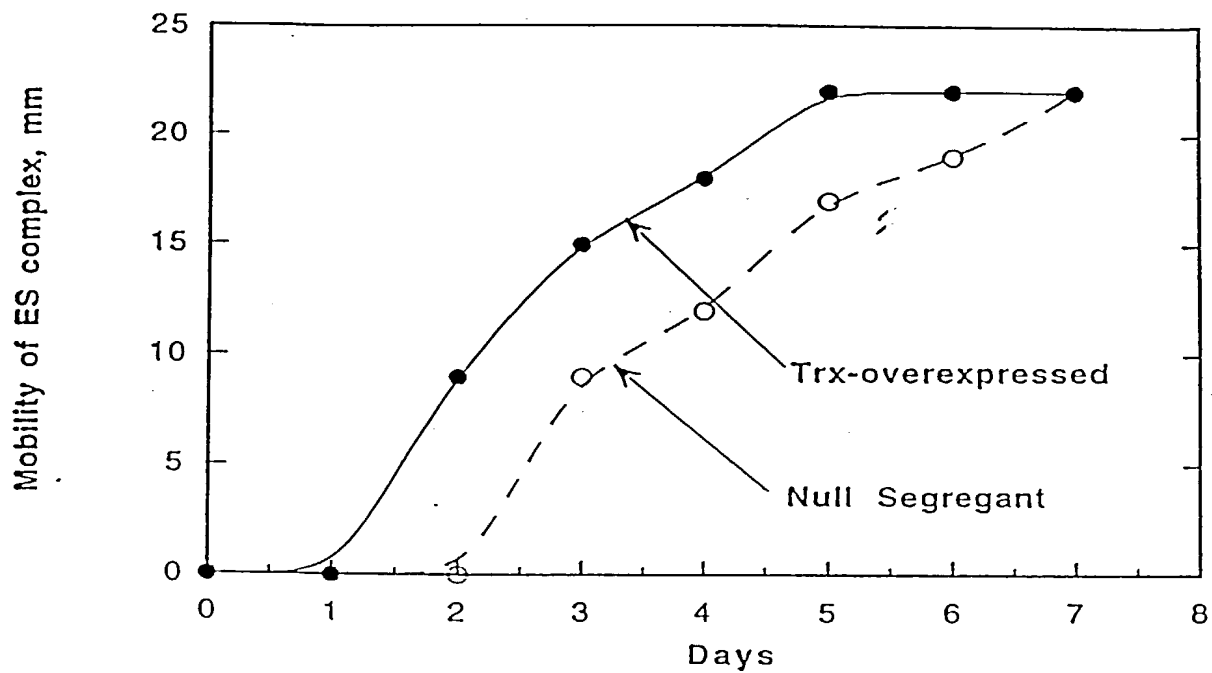
**0    1    2    3    4    5    6    7**

C

### Trx-overexpressed

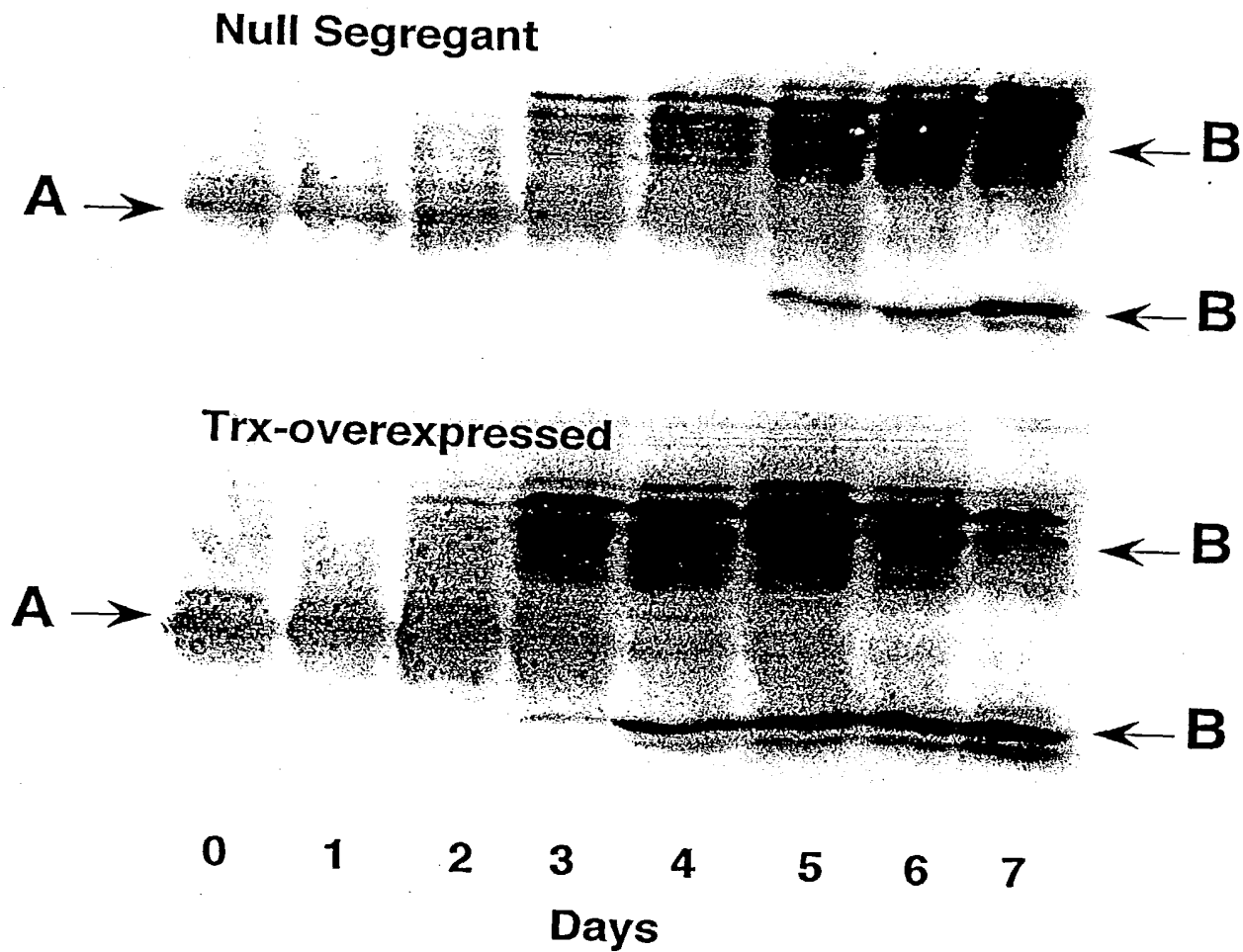
D

**FIGURE 15**





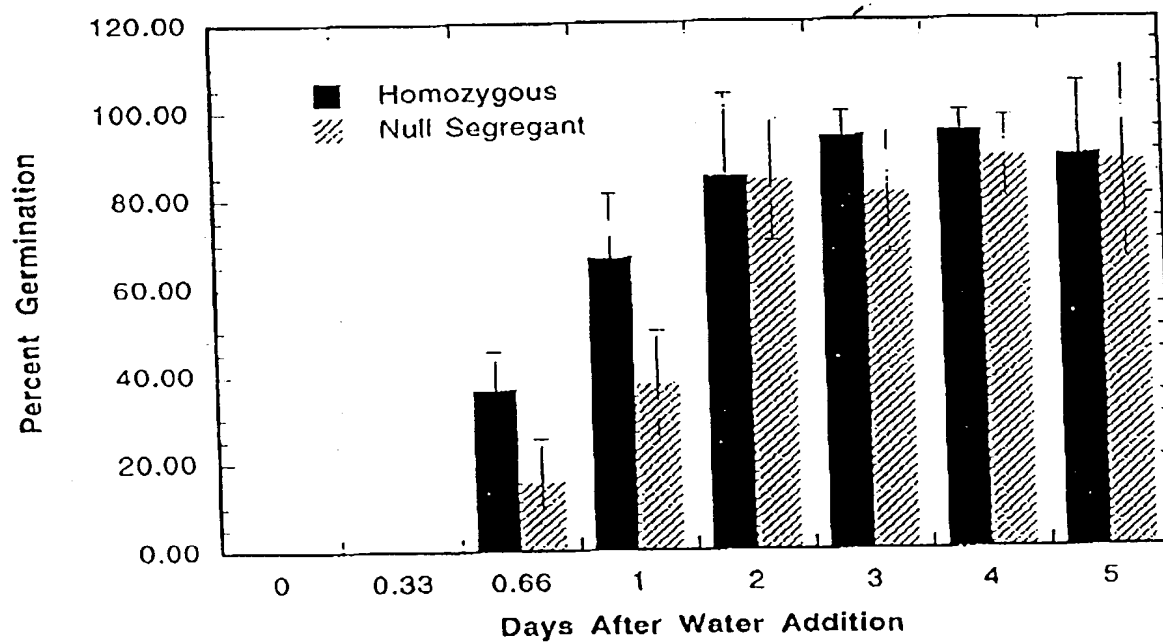
**FIGURE 16A**



**FIGURE 16B**

## FIGURE 17

Percent Germination of Transgenic Barley Grain  
Over-Expressing Wheat Thioredoxin



**FIGURE 18**

**Different Relative Redox Status of Protein Fractions  
in Transgenic Barley Grain Over-Expressing  
Wheat Thioredoxin h vs. the Null Segregant:  
Dry and Germinating Grain**

